PALYNOLOGICAL STUDIES ON THE SOUTH INDIAN MYRTALES

The Myrtales are a fairly large order distributed in the tropical, subtropical and warm temperate regions. Members of the core families of the order are characterized by bicollateral vascular strands in the primary stem coupled with vestured pits in the secondary xylem. The combined occurrence of these two anatomical attributes is considered to be critical in the delimitation of the order. There exists great deal of discord and disagreement concerning the circumscription, composition and interrelationship among the various classificatory treatments of the group, both classical and modern.

Among the classical treatments, Bentham and Hooker's (1865) is the most comprehensive which comprises six families, (Rhizophoraceae, Combretaceae, Myrtaceae, Melastomaceae, Lythraceae, and Onagraceae). This composition has been greatly reshuffled and revised in the modern treatments, of which the fairly accepted one is that of Dahlgren and Thorne (1984), which comprises fourteen families in the order, some of which are splinter ones. Palynological data on a fairly large sample of taxa from a single geographical region is considered to be a potential supplementary tool used in straightening and solving taxonomic issues and systematic relationships. Despite the potential use of palynological evidence in this regard very little of such information is available on the myrtalean group of families. Almost the entire previous data are on alien taxa and that too Light Microscopic. The present work has been undertaken as an attempt to fill this gap by carrying out palynological study a sizeable number of taxa of the order

of the South Indian region. LM studies have been carried out in 108 species and SEM studies in 62 species belonging to 42 genera in the South Indian region belonging to the six families of Bentham and Hooker. Pollen morphological studies were carried by acetolysis method. Details of various important palynological features like aperture, exine sculpturing, pollen size and shape following the terminology of Erdtman, Nair and Walker and Doyle has been provided. A family wise description of various pollen morphological features, have been provided. The pollen aperture in all the families are basically 3-zonocolporate but with some variation in aperture number and structure in different families. Subsidiary colpi (pseudocolpi) isomerous with the number of apertures have been noticed in Combretaceae, Melastomaceae and Lythraceae (also double the number of apertures). A peculiar and unique pollen form characterized by the protruding (aspidote) type occurs in Onagraceae. Members of Myrtaceae exhibited syncolpate, syncolporate, parasyncolporate, longicolpate or brevicolpate apertures. The secondary character, exine sculpturing is highly varied in the member families of the order ranging from psilate, granulate, rugulate, striate, punctate, reticulate etc. frequency and distribution of which varies considerably in different families. Onagraceae is characterized by the presence of viscin threads which are formed by ektexinous material. Various shape categories of the pollen grains exists in the group of families. Except Rhizophoraceae with unipalynous (stenopalynous) pollen, all the others were multipalynous (eurypalynous) in varying degrees.

The results of the study were discussed in relation to various pertinent aspects which include morphological evolution of pollen grains, systematic issues,

interrelationships, evolution and affinities of the order. A tentative scheme of evolution of aperture form in Myrtales is presented according to which the most primitive 3-colpate occurs in Myrtaceae and in *Trapa* (Onagraceae) while the 3-colporate occurs in all the six families together with 2, 4, and 5 rarely. The most advanced porate condition that is 2 to 5-porate occurs in Onagraceae and 3-porate in one genus of Lythraceae. It appears that aperture evolution has most operated in Onagraceae where 3, 4-colporate and 2, 3, 4, 5-porate condition exists. The more or less intermediate aperture condition syncolporate/parasyncolporate occurs in Myrtaceae and Lythraceae. The findings have displayed that the Lythraceae has most diverse pollen in terms of aperture structure, followed by Myrtaceae. The family Onagraceae is found to be distinctive in Myrtales characterized by viscin threads, aspidote aperture, thick endexine, tetrads and /or polyads in some.

The merits and feasibility of revisionary treatments of the order proposed by the modern taxonomists have been discussed on the basis of palynological findings. All members of Rhizophoraceae possess tricolporate pollen as in other myrtalean families. But the possession of punctate ornamentation and fused endoapertures that are rectangular-lolongate which is unknown in the other core families of myrtales together with lack of bicollateral vascular bundles and vestured pits swings heavily against placement of Rhizophoraceae in Myrtales. The families Combretaceae and Melastomaceae have enough palynological qualifications to be included in the Myrtales. But Myrtaceae pollen does not appear to have any close similarity to other core Myrtales except for some superficial similarity with Onagraceae. The separation of the genera

Barringtonia, *Careya* and *Couropita* which belong to Bentham and Hooker's Myrtaceae to a separate family rank (Lecythidaceae) is palynologically justifiable. Lythraceae has been subjected to great deal of taxonomic restructuring based on various disciplines including palynological. Infra-generic variation in palynological characters was remarkable as in *Cuphea*. Major deviation from Bentham and Hooker's treatment is the recognition of familial and sub-familial rank given to genera such as *Sonneratia*, *Duabunga* and *Punica*. The present results appear to suggest that *Sonneratia* and *Punica* stand out from the rest of the members of Lythraceae, and hence on palynological ground the sub-familial or familial rank assigned to them is justifiable. The palynological distinction of *Sonneratia* appears to be strong enough for this being given a family rank. Onagraceae is a distinct family on several grounds including palynological being characterized by the unique large central body, aspidote apertures, and presence of viscin threads. The proposed separation of the genus *Trapa*, from Bentham and Hooker's Onagraceae to a separate family rank appear to gain palynological support because of the presence of the meridional ridges formed by the folding of exine, dome-shaped aperture and absence of viscin threads.

A general discussion is provided in which interrelationships, evolution and affinities of the order Myrtales are considered. Attempt is made to view the merits of the major revisionary treatments of the order in the light of evidence from available palynological information. Separation of the Rhizophoraceae from the myrtalean complex, formation of a new family, Lecythidaceae for accommodating certain genera of the Myrtaceae, assignment of familial rank to the Onagraceous genus *Trapa* etc. have

been shown to be justifiable on palynological ground. Concerning the relationships, evolution and affinities of Myrtales there is no fair agreement although it is generally agreed that it is related to Rosiflorae including Rosales and Saxifragales. Although, numerous studies (morphological, anatomical, embryological, cytological, palynological, phytochemical and molecular) have been conducted by a host of workers on the Myrtales, and yet a convincing consensus concerning inter relationships among the families of the order and its phylogeny and evolution and affinities still remain elusive.